

Cody Rivera

Curriculum Vitae

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Education

- 2022–present **Ph.D. in Computer Science**, *University of Illinois Urbana-Champaign*, Urbana, IL
Expected Completion Date: May 2027.
- 2018–2022 **B.S. in Computer Science and Mathematics**, *University of Alabama*, Tuscaloosa, AL
Summa Cum Laude. GPA: 4.0/4.0.
Minor: Randall Research Scholars Program.

Research Experience

- 2022–present **Graduate Research Assistant**, *University of Illinois Urbana-Champaign*, Urbana, IL
Using approximate solvers for non-linear real arithmetic to speed up differential privacy verification and expand the class of programs that can be verified. Supervised by Dr. Mahesh Viswanathan.
- 2019–2022 **Undergraduate Research Assistant, High-Performance Computing and Data Analytics Lab**, *University of Alabama/Washington State University*, Tuscaloosa, AL
Researched parallel GPU algorithms to process vast amounts of data in scientific computation workloads such as large scale simulations more efficiently. Supervised by Dr. Dingwen Tao.
- Summer 2021 **Science Undergraduate Laboratory Internship (SULI) Program Intern**, *Argonne National Laboratory*, Virtual Internship
Improved the performance of lossy decompression for multidimensional scientific datasets by optimizing parallel Huffman decoding for GPUs. Supervised by Dr. Sheng Di.

Publications

Accepted Conference Publications

- IPDPS 2022 **C. Rivera**, S. Di, J. Tian, X. Yu, D. Tao, and F. Cappelto, “Optimizing Huffman Decoding for Error-Bounded Lossy Compression on GPUs,” *The 36th IEEE International Parallel and Distributed Processing Symposium*, Virtual Event, May 30-June 3, 2022, pp. 717-27. [Acceptance Rate: 25% (123/474)]
- Cluster 2021 J. Tian, S. Di, X. Yu, **C. Rivera**, K. Zhao, S. Jin, Y. Feng, X. Liang, D. Tao, and F. Cappelto, “Optimizing Error-Bounded Lossy Compression for Scientific Data on GPUs,” *2021 IEEE International Conference on Cluster Computing*, Virtual Event, September 7-10, 2021, pp. 283-93. [Acceptance Rate: 29% (48/163)]
- IPDPS 2021 J. Tian, **C. Rivera**, S. Di, J. Chen, X. Liang, D. Tao, and F. Cappelto, “Revisiting Huffman Coding: Toward Extreme Performance on Modern GPU Architectures,” *The 35th IEEE International Parallel and Distributed Processing Symposium*, Virtual Event, May 17-21, 2021, pp. 881-91. [Acceptance Rate: 22% (105/462)]
- PACT 2020 J. Tian, S. Di, K. Zhao, **C. Rivera**, M. H. Fulp, R. Underwood, S. Jin, X. Liang, J. Calhoun, D. Tao, and F. Cappelto, “cuSZ: An Efficient GPU-Based Error-Bounded Lossy Compression Framework for Scientific Data,” *The 29th International Conference on Parallel Architectures and Compilation Techniques*, Atlanta, GA, Oct 3-7, 2020, pp. 3-15. [Acceptance Rate: 25% (35/137)]

Refereed Journal Publications

JPDC **C. Rivera***, J. Chen*, N. Xiong, S. Song, and D. Tao, "TSM2X: High-Performance Tall-and-Skinny Matrix-Matrix Multiplication on GPUs," *Journal of Parallel and Distributed Computing*, Volume 151, 2021, pp. 70-85. [Impact Factor: 3.734]

Awards

2022–2026 **Graduate College Fellowship**, *University of Illinois Urbana-Champaign*
2022–2026 **SURGE Fellowship**, *Grainger College of Engineering, University of Illinois Urbana-Champaign*
2022–2023 **Wing Kai Cheng Fellowship**, *Department of Computer Science, University of Illinois Urbana-Champaign*
Summer 2022 **Fellowship Grant**, *Oregon Programming Languages Summer School, University of Oregon*
Spring 2022 **Outstanding Undergraduate Award**, *Department of Computer Science, University of Alabama*
Spring 2022 **H. H. Chapman Outstanding Computer User Award**, *Randall Research Scholars Program, University of Alabama*, \$500
Fall 2021 **R&D 100 Award Winner**, *For "SZ: A Lossy Compression Framework for Scientific Data"*
2018–2022 **Engineering Leadership Scholarship**, *College of Engineering, University of Alabama*
2018–2022 **Presidential Scholarship**, *University of Alabama*

Software Artifacts

cuSZ A GPU version of SZ, an error-bounded lossy compressor for scientific data, implemented in CUDA C++ for Nvidia GPUs. Compresses data with compression ratios up to 3.48x higher than other state-of-the-art GPU lossy compressors. [URL: <https://szcompressor.org/>]
TSM2X A collection of two GPU algorithms for multiplying irregular-shaped tall-and-skinny matrices: TSM2L and TSM2R. Implemented in CUDA C++ and tuned to obtain average speedups of 1.9x over the vendor-supplied CUBLAS library. [URL: <https://github.com/codyjriviera/tsm2x-imp>]

Other Experience

Fall 2019 **Undergraduate Teaching Assistant (CS 100: Computer Science I for Majors)**, *University of Alabama*
Spr./Fall 2020 *Tuscaloosa, AL*
Tutored students during laboratory sessions and graded student projects.
Summer 2020 **Student Training in Engineering Program (STEP) Intern**, *Google*, Virtual Internship
Developed GrowPod, a web app that allows users to join, create, and administer community gardens using Google Cloud App Engine and Angular.

Workshops and Summer Schools

Summer 2022 **Oregon Programming Languages Summer School**, *University of Oregon, Eugene, OR*

Coursework and Technical Skills

Relevant Coursework:

- **University of Illinois:** Proof Automation (in-progress), Compiler Construction (in-progress)
- **University of Alabama:** Programming Languages, Compiler Construction, Real Analysis I and II, Abstract Algebra I and II, General Topology, Algebraic Topology

*Equal contribution

Programming Languages: C, C++, Python, Java, JavaScript, TypeScript
Platforms and Tools: CUDA, OpenMP, Google Cloud, HTML, CSS, LaTeX